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ABSTRACT

The ownership/access debate is considered in the context of communication with library users. As part of a dialogue regarding library resources, a citation analysis was undertaken to assist in describing the collection at the New Mexico State University (NMSU) library to faculty researchers and other library users. References cited in faculty publications for the years 1988 to 1991 were analyzed to determine if they were owned by the library. The study sample consisted of 2,995 citations from 420 publications of 54 randomly selected faculty. Overall, 70.4% of the cited material was owned by the library. Cited journals were more likely to be owned (81.6%) than cited books (67.3%). Comparisons are made between types of citations and publications and of library holdings of cited material in the science, humanities, and social science areas. Five tables present (1) background data for population sample by faculty rank; (2) average numbers of publications and citations by academic group (January 1988 to September 1991); (3) comparison of publication and citation types per faculty member by academic group; (4) percentage of cited material in the library by type of citation; and (5) percentage of cited material in library by academic group and type of citation. (Contains 10 references.) (Author/MES)

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Communicating with Faculty about the Collection: Citation Analysis & Beyond

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COMMUNICATING WITH FACULTY ABOUT THE COLLECTION: CITATION ANALYSIS AND BEYOND

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Abstract: The ownership/access debate is considered in the context of communication with library users. As part of a dialogue regarding library resources, a citation analysis was undertaken to assist in describing the collection at the NMSU library to faculty researchers and other library users. References cited in faculty publications for the years 1988 to 1991 were analyzed to determine if they were owned by the library. The study sample consisted of 2995 citations from 420 publications of 54 randomly selected faculty. Overall, 70.4% of the cited material was owned by the library. Cited journals were more likely to be owned (81.6%) than cited books (67.3%). Comparisons are made between types of citations and publications and of library holdings of cited material in the science, humanities, and social science areas. The results of this study are presented to library users along with information regarding access to material not in the collection. Presentation of this type of information and of current techniques of accessing scholarly information should be part of a library awareness program.

Academic libraries are understandably concerned about their image and success as providers of information to support teaching and research. How should we respond to negative comments from users concerning the collection? The ownership/access debate may be familiar to librarians but our users are likely to be unaware of it. With the continuing proliferation of literature, finite (and sometimes shrinking) budgets, and materials price escalations, libraries are destined to own a decreasing percentage of the available material. Better access to materials not owned by the library is essential but although "access" to materials is a major topic of interest today, local ownership should not be ignored. An evaluation of the collection can establish a baseline from which to respond to user's concerns and questions. The sheer number of volumes owned may be important, but the percentage of journals used (and cited) that are on the library's shelves may be more important to faculty. Indeed, if the library does have most of the journals cited by the researcher we should be eager to communicate this fact to our users. Citation analysis can be used to determine what percent of journals used for research purposes is owned by the library.

No library can own all material published, and few would desire to do so, given space considerations. The establishment of a percentage of material owned, however, can be important for several reasons. First, it helps the user estimate the likelihood of finding a needed work in the library. Next, it establishes an ownership figure from which to compare different collections or subsets of a collection. Further, if and when future cuts in purchased materials are necessary, the library has a set of baseline data that may be useful for decision-making in collection management. Ownership figures may be important in other ways as well. Today, for example, with CD-ROM indexes so commonly available to users, reference librarians may be called upon to estimate the percentage of journals indexed on a particular product that are owned by the library. Librarians may even suggest a CD-ROM be used, based on knowledge of local ownership of journals. This might be done as a service to the undergraduate whose paper is due "tomorrow."

Material ownership, of course, is only part of the materials access equation. Rapid access to unowned material is another. In many cases today our delivery systems are inadequate.

Generally speaking, users are not content to wait weeks for material but may not mind waiting a few days. If trends continue, document delivery may become so rapid that differences between ownership and access become nearly obliterated. For some, however, the convenience of the published hardcopy as opposed to a faxed copy may remain of great importance. Our responsibility to users includes both access and ownership. "Libraries should not be talking about access *versus* ownership because both are relevant and both will continue to be necessary."[1]

It is desirable that faculty be active library users and supporters. Dougherty and Bloomquist [2] felt that "attitudes exhibited by users toward the library may be as important as, or even more important than, actual library effectiveness." A patron's feelings about the usefulness of a library may determine its actual usefulness for that patron, regardless of any objective measures. Furthermore, attitudes of the teaching faculty toward the library, and their use of the library, can be a major factor in library use by students [3]. Providing information about the ability of the library to support research gives users an estimate of the likelihood of successfully retrieving material in the library. It is the premise of this paper that communicating with faculty about access to literature will encourage academic discussion and may increase faculty use and support of the library. This dialogue should include: current techniques to access literature such as CD-ROM, current awareness services, Internet use, and on-line index tools; the breadth and depth of the collection in the library; new formats of literature such as electronic journals; document delivery options including speed of delivery; and discussion of how the proliferation of literature and its increasing cost is driving the access/ownership dialogue.

Citation analysis is a good place to start this discussion because it uses real and therefore relevant publications and citations. When done within a library serving a closed academic community such as a single university, the analysis is applicable to all faculty and other library users. Use of citation analysis to evaluate a collection is based on the principle that actual use of literature is an indicator of its relevance to research [4]. By checking the citations of our faculty researchers, we can determine the titles of many of the publications they used in their research.

The extent of our library's holdings of those citations is one indication of our ability to support that research.

Nisonger [5] presented a good review of the use of citation checking to evaluate academic library collections. He concluded that citation checking is a flexible approach since it can be used to assess an entire collection, or specific disciplines or topics, as well as different formats of materials. Citation checking was used to evaluate library support of faculty research at branch campuses at Pennsylvania State University [6]. That study analyzed 706 book and 1130 journal citations from 149 faculty publications. They found a total of 82% of the cited material in the University Library's collection, (88.2% of cited journals and 73.3% of cited books). When analyzed by academic area, 92% of the cited journals from the science group were found in the library versus 80.2% in the social sciences and 73.8% in the humanities. For cited and owned books there were 78.2% in the social sciences versus 73.2% in the sciences and 73.8% in the humanities. Library support for doctoral student research was investigated at UC Irvine by looking at 1144 citations from 12 dissertations [7]. The percentages of citations found in the UC Irvine library were 91.6% for humanities, 93.7% for sciences, and 85.9% for social sciences. The overall holdings of cited material was 80.6% for monographs and 90.2% for serials.

The major research question considered in this paper is: what percentage of publications cited by faculty are held in the New Mexico State University library? Relevant comparisons include the types of cited as well as published material and the holdings of cited material, e.g., book versus journal holdings, or humanities versus social sciences holdings.

New Mexico State University is the land grant institution for the state of New Mexico. It has approximately 15,000 full time students. Of these, there are nearly 2400 graduate sudents in 45 masters and 19 doctoral programs. The university is a Carnegie I research institution and the library receives nearly 7,000 serial subscriptions and holds more than 900,000 cataloged items.

One of the limitations of this type of study is that authors may not cite every publication that they use. Another is that the technique is oriented towards the needs of library patrons who publish. In a university-wide cross-disciplinary study such as the present one, these limitations

should be minimized. For the purpose of this study, it will be assumed that authors used and cited material whether it was held in the library or not, i.e., faculty used ILL or another method of document delivery to obtain material not in the library. It will also be assumed that all works cited were actually used.

METHODS

NMSU faculty members were divided into 3 academic groups for the purpose of comparison. The group names were Humanities, Social Sciences, and Sciences. Within each academic group there were between 8 and 22 departments (Appendix I). Within each group random samples of approximately 12% of the faculty members were chosen for inclusion in the citation analysis.

Faculty publications for the period January 1988 to September 1991 were identified using *Science Citation Index, Social Science Citation Index*, and *Arts and Humanities Citation Index* (ISI, Philadelphia). Publications were identified online by author name and the search results included the cited references for each publication. In addition, *Faculty/Staff Publications and Creative Work* [8], a yearly publication listing all of the publications of NMSU faculty, was used to verify publications and those not included in the ISI citation indexes were added to the sample. A maximum of 10 citations per publication were used. Where more than 10 works were cited in a publication, a randomly selected sample of 10 citations was used.

All publications and citations were classified according to publication type: journal, book, abstract or proceeding, report or bulletin. Book chapters and books were treated similarly. Some material was excluded from the study such as reviews, field notes, theses, dissertations, and letters. Military technical reports that NMSU library would not be expected to collect were also excluded. The sampling method is a two-stage sampling technique using units of unequal size [9]. Library holdings of the cited works were determined. In addition, 10% of the owned publications were randomly selected and checked for availabilty on the shelves. Citation data was presented and compared on an author basis in order to avoid bias towards more prolific authors whose publications would represent a disproportionate part of their academic groups. Sample means were compared using a large sample test [10]. For comparison between means, the following formula was used to determine the significant difference: $2\sqrt{(SE1^2 + SE2^2)}$. A significant difference existed if the difference between the two means being compared was greater than this number.

RESULTS

The publications of 81 faculty were sampled. These represented 12% of the 685 fulltime tenure-track faculty employed at NMSU at the time of the study. There were approximately the same number of assistant, associate and full professors sampled (Table 1). The sample very closely represented the actual population when compared by faculty rank. Three instructors were included in the sample but none had publications with citations. The instructors and assistant professors had fewer publications than associate or full professors. The faculty averaged 5.5 publications each over the study period (about 3.5 yrs) and there were an average of 14.9 citations per publication. Of the 81 faculty sampled, 27 either had no publications or none with citations. The other 54 faculty had 420 publications containing 2995 citations that were sampled. The faculty that published averaged 7.8 publications for the study period.

Faculty in the Science group had the highest average number of publications (6.9) over the study time period (Table 2). A comparison with the Social Science group (3.1 publications each) revealed a statistically significant difference. The Humanities faculty averaged 5.3 publications.

The types of materials published differed in several respects when compared between the three academic groups (Table 3). Most of the Humanities publications (74%) were in journals. Materials published by the Social Sciences group were predominantly chapters or books (43%) or journal articles (37%). The publications of the Science group were predominantly journals (42%), but were more evenly divided among the four types of publications, reflecting the greater likelihood of this group publishing reports and abstracts. Both of the latter formats were used more than books for publication by Science faculty.

Statistically, there were significant differences in publication types between academic groups only for abstracts/proceedings and reports/bulletins (Table 3). The Science group had more published abstracts/proceedings and reports/bulletins than either the Humanities or Social Science group. While the Humanities group had more journal publications than the Social Science or Science groups, the differences were not statistically significant. Conversely, the Social Science group had a higher, but not statistically significant, average number of book publications. The

high standard errors are due to differences in numbers of publications between faculty members. Because some of the absolute differences are large, they are discussed here despite not being statistically significant .

There were differences as well in the types of material cited (Table 3). The Science group tended to cite journals more often (68%) than any other type of material. The Social Science group cited books most often (49%), as did the Humanities group (56%). Both Humanities and Social Science groups cited books more often than the Science group, which cited books only 13% of the time. These results are in general agreement with Broadus' [11] review of citation in social science literature. There, social sciences disciplines cited a high percentage of books but fewer than humanities disciplines and both groups cited more books than science disciplines.

The primary focus of the current study was whether the cited references were owned by the library. This is the information that was designed to determine potential strengths and weaknesses of the collection. The overall percentage of cited material found in the library was 70.4% (Table 4). When comparisons were made between types of cited material owned by the library, books and journals were found at the highest percentages. More cited journals (81.6%) were found in the library than cited books (67.3%). Both formats were held by the library more often than abstracts/proceedings (38.6%) or reports/bulletins (35.8%). These differences were statistically significant.

Comparison of cited and owned material among academic groups revealed two major differences (Table 5). For total cited material owned by the library there was more material in the Science than the Humanities group (73.8% v. 60.1%). The library also owned more cited abstracts/proceedings in the Science than in the Social Science group. The range for cited and owned journals was 84.4% (Science) to 72.2% (Humanities). For books cited and owned the range was 69.6% (Science) to 57.5% (Humanities). The range of cited/owned materials in the other categories was 46.4% (Science abstracts/proceedings) to 14.3% (Social Science abstracts/proceedings). Finally, the percentage of material available on the library shelves was 99%. There were therefore very few missing or misplaced materials in this sample.

DISCUSSION AND CONCLUSION

The continuing growth of literature, including electronic scholarly communication, serves to promote the partnership between university faculty and the information professional. Communicating with faculty about the collection and the changing scope of information strengthens this bond. The ongoing dialogue will include both access, whether physical or bibliographic, and ownership issues. Citation analysis can be used to address ownership concerns.

The results of the citation analysis provide a description of the NMSU library collection by format of material and academic discipline. The areas where differences in holdings occur have been delineated and we are now able to provide faculty with a measure of how well the NMSU library collection directly meets their research needs. The collection contained more than 80% of the journals cited and, for all material combined, more than 70%. In general, journals can be expected to be found most frequently, followed in frequency by books. The lower percentage of cited reports/bulletins and abstracts/proceedings is a reflection of a collection management policy to collect less heavily in these formats. When the total cited and owned material was compared among Humanities, Social Science, and Science groups there was a higher percentage in the Science group. This difference was statistically significant between the Science and Humanities groups. For specific types of material between groups, however, only the difference in abstracts/proceedings cited and owned was statistically significant. While the Science faculty at NMSU may enjoy a greater likelihood of finding material in the library, the disparity between the science material holdings and the holdings of the other academic groups is not a great one. These results form the major findings of the study.

Regarding publication types, there were several differences between academic groups. The Humanities faculty appeared to publish predominantly in journals (74%) and the Social Sciences faculty published most often in books (43%). Science faculty also published most often as journal articles (42%), but also tended to publish more abstracts/proceedings (28%) and reports/bulletins

(19%) than either the Social Sciences or Humanities groups. Faculty from the Colleges of Agriculture, for example, often publish in report or bulletin form.

Comparison with the Penn State study is appropriate. An overall 70% of the cited material was owned by NMSU library versus 82% at Penn State. The Penn State study found 88% of cited journals and 73% of cited books owned by the library. In comparison, the NMSU study showed 82% of journals and 67% of the cited books owned by the library. The ratio of cited and owned books to journals, however, is quite similar for the two libraries. For corresponding academic groups the differences in cited and owned journals were as follows (NMSU/Penn State): Science journals 84%/92%; Humanities journals 72%/73.8%; Social Science journals 81%/80.2%. The percent holdings of cited journals in the social sciences and humanities were nearly identical for the two libraries. For cited and owned books the differences were as follows (NMSU/Penn State): Science books 70%/73.2%; Humanities books 58%/73.8%; Social Sciences books 68%/78.2%. Perhaps no given percentage eg., 80 or 90 percent, of owned material can be established as adequate for researchers' needs. However, knowing what percentage the library owns can be useful for estimating the likelihood of finding material on the shelf or, conversely, having to request delivery through ILL or other means. While the current study was not designed to assist in making specific collection management decisions, citation analysis does have that ability.

The results of the citation study are being made available to faculty to promote discussion of the data and to supplement the information access dialogue in general. It is true that the extent of the library's holdings varies in different subject areas based on collection development policy. However, in some cases there may be a disparity between faculty perception of satisfaction with holdings and objective data about the collection. Communication of our results to the faculty is occurring through various channels. The results have been presented in a library newsletter which is printed quarterly and distributed to all faculty. Daily transactions at the reference desk give reference librarians an opportunity to clarify holdings information, and department liaison librarians also convey information regarding the collection. In addition, the library dean has shared the findings with the deans' council and at other informational meetings.

Faculty are rapidly becoming more sophisticated in the use of electronic access tools that until recently were the domain of the information professional. Witness the great possibilities provided by access to data and literature through the Internet. With an increased access to literature, faculty require more information about the scope of the information universe including the extent of local library collections. Librarians are becoming active in assisting users in learning to access scholarly electronic information. At NMSU, for example, library faculty present information at seminars and workshops at the department and college level, sometimes in cooperation with the university computer center. Sessions range from those with a narrow focus such as compliance with federal regulations, to ones with a broader focus such as the scope of electronic information, and how to use tools such as gophers to identify information sources and FTP to retrieve files. At NMSU bibliographic access using the online catalog, CD-ROM indexes, and our online search service, has recently been supplemented by a current awareness service. Improved document delivery is a continuing project. Timely access to information is a primary key to supporting library users and such access is one of the most rapidly changing areas of librarianship. Surely, given timely access, we can adequately address user concerns about our collections. As informed users, our faculty make stronger library supporters.

The author wishes to acknowledge his appreciation to Charles Townley, Dean of the NMSU Library, whose assistance on this project was invaluable.

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Table 1

Background Data for Population Sample by Faculty Rank

Rank	Number of faculty Sampled	Publications Avg.	Publications S.E.	Citations Avg.	Citations S.E.	Citations /Publ.
Instructor	3	1.0b	1.0	0.0	0.0	0
Assistant Professor	25	2.0b	0.5	16.3	6.4	8.1
Associate Professor	24	6.6a	1.6	92.8	23.7	14.1
Professor	29	8.1a	1.8	124.8	38.3	15.4
Total	81	5.5	0.9	77.2	16.2	14.9

Table 2

Average Numbers of Publications and Citations by Academic Group (January 1988 to September 1991).

Group	Number of Faculty Sampled	Publications Avg	SE	Citations Avg.	SE	Citations/ publication
Humanities	11	5.3ab	1.8	112.6	40.6	21.2
Social Science	32	3.1b	1.0	47.1	16.2	15.2
Science	38	6.9a	1.5	91.9	29.4	12.3
						mean=14.9

Table 3

Comparison of Publication and Citation Types Per Faculty Member by Academic Group

Type and Group	Publications Avg.	S.E	Citations Avg.	SE
Journal				
Humanities	3.9 (74%)	1.5	39.1 (35%)	13.4
Social Science	1.1 (37%)	0.3	18.1 (38%)	5.8
Science	2.9 (42%)	1.1	62.9 (68%)	25.2
Books				
Humanities	1.0 (19%)	0.4	62.5 (56%)	33.2
Social Science	1.3 (43%)	0.9	23.0 (49%)	11.8
Science	0.8 (12%)	0.3	11.8 (13%)	4.4
Abstract/Proceeding				
Humanities	0.3b (6%)	0.2	8.0 (7%)	5.4
Social Science	0.3b (10%)	0.2	4.3 (25%)	2.1
Science	1.9a (28%)	0.5	6.6 (7%)	2.5
Report/Bulletin				
Humanities	0.1b (2%)	0.1	3.0ab (3%)	3.0
Social Science	0.3b (10%)	0.2	1.7b (4%)	1.2
Science	1.3a (19%)	0.4	10.6a (12%)	4.3

Table 4

Percentage of Cited Material in the Library by Type of Citation.

Format of Cited Reference	Percent	S.E.	Number. of Citations in sample
Journal	81.6%a	2.5%	1805
Book	67.3%b	4.2%	682
Abstract/Proceeding	38.6%c	6.6%	183
Report/Bulletin	35.8%c	7.2%	325
TOTAL	70.4%		2995

Table 5

Percentage of Cited Material in Library by Academic Group and Type of Citation.

Group/Type of material	%	S.E.	Number of Citations in sample	Number of Faculty in sample
Humanities				
Journal	72.2	6.5	107	
Book	57.5	10.4	152	
Abstract/Proceeding*	22.2	17.0	7	
Report/Bulletin	40.0	20.2	22	
Total**	60.1	5.5	288	8
Social Science				
Journal	81.3	4.9	234	
Book	67.7	7.0	166	
Abstract/Proceeding	14.3	12.4	45	
Report/Bulletin	24.9	11.0	33	
Total	64.7	4.8	478	17
Science				
Journal	84.4	3.0	1464	
Book	69.6	6.1	364	
Abstract/Proceeding	46.4	9.0	131	
Report/Bulletin	45.8	8.8	270	
Total	73.8	3.6	2229	29
GRAND TOTAL	70.4%		2995	54

*Abstracts Sci>Soc Sci
** Total Sci>Hum

APPENDIX I

Academic Groups in the Citation Study, and Names of Departments within each Group.

Humanities
- Art
- English
- Foreign Languages
- History
- Journalism and Mass Communication
- Music
- Philosophy
- Theatre Arts

SOCIAL SCIENCES
- Accounting and Business Computer Systems
- Communication Studies
- Counseling and Educational Psychology
- Criminal Justice
- Curriculum and Instruction
- Educational Management and Development
- Economics
- Finance, Insurance, and Real Estate
- Government
- Library
- Management
- Marketing and General Business
- Physical Education, Recreation, and Dance
- Psychology
- Social Work
- Sociology and Anthropology
- Special Education/Communication Disorders

Sciences
- Agricultural and Extension Education
- Agricultural Economics and Agricultural Business
- Agronomy and Horticulture
- Animal and Range Science
- Astronomy
- Biology
- Chemical Engineering
- Chemistry
- Civil, Agricultural, and Geological Engineering
- Computer Science
- Earth Science
- Electrical and Computer Engineering
- Engineering Technology
- Entomology, Plant Pathology, and Weed Science
- Experimental Statistics
- Fishery and Wildlife Sciences
- Health Science
- Home Economics
- Mathematical Sciences
- Mechanical Engineering
- Nursing
- Physics